MSE 'PERCEPTION'

Exhibit No. 24

TIME ESTIMATION

a) Press the RESET switch.

Press and hold the TIME switch.

When in your estimate, 1 second has elapsed, release the switch. The counter shows the actual elapsed time.

b) Press the RESET switch.

Press and hold the TIME switch.

When in your estimate, 5 seconds have elapsed, release the switch. The counter shows the actual elapsed time.

According to one theory, we have an internal body clock which helps us to monitor the passage of time. According to another theory, events which fill the passage of time help us to perceive time.

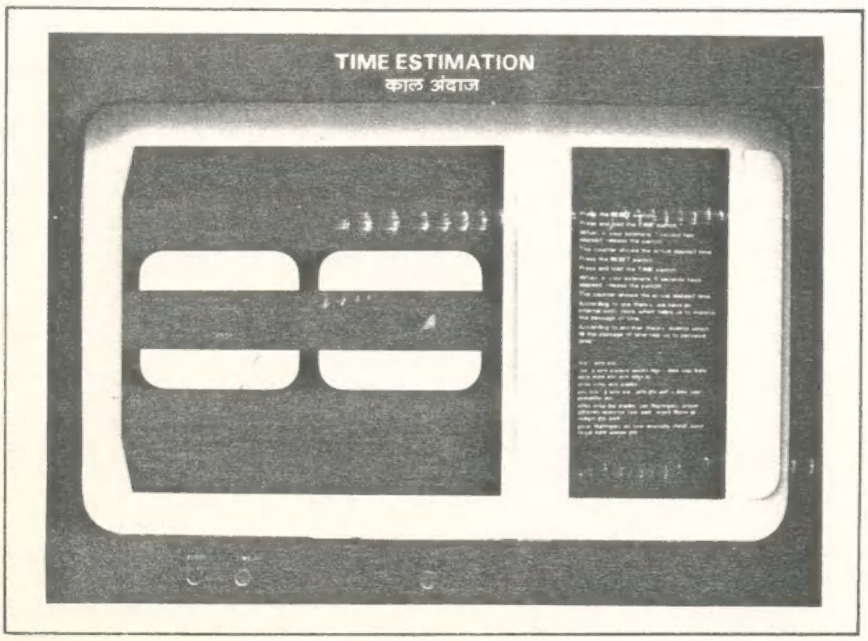
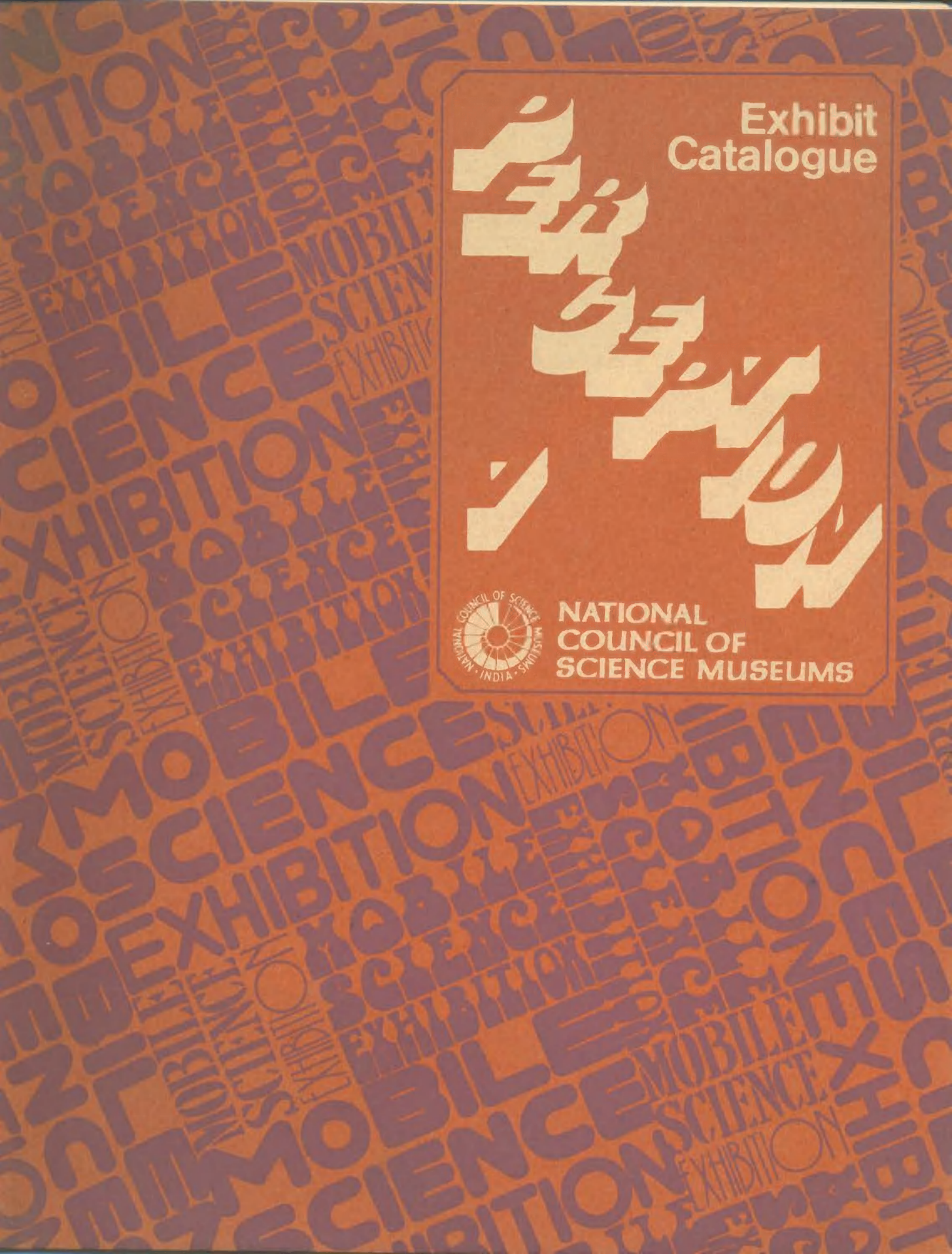


Exhibit Catalogue



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Mobile Science Exhibits

PERCEPTION 1

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JANUARY 1988

MSE PERCEPTION I

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3. EQUAL OR NOT?
4. PERSISTENCE OF VISION
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7. COLOURS IN WHITE LIGHT
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20. ONE OR TWO?
21. SMELL
22. REACTION TIME
23. EYE-BODY CO-ORDINATION
24. TIME ESTIMATION

MSE 'PERCEPTION'

Exhibit No. 1

BLIND SPOT

The retina of the eye contains light sensitive receptors. When light falls on these receptors, they produce electrical signals. The electrical signals pass out of the eye through the optic nerve. No receptors are present at the site of the optic nerve. This area is called Blind Spot. Images falling on the Blind Spot cannot be seen.

To locate the Blind Spot,

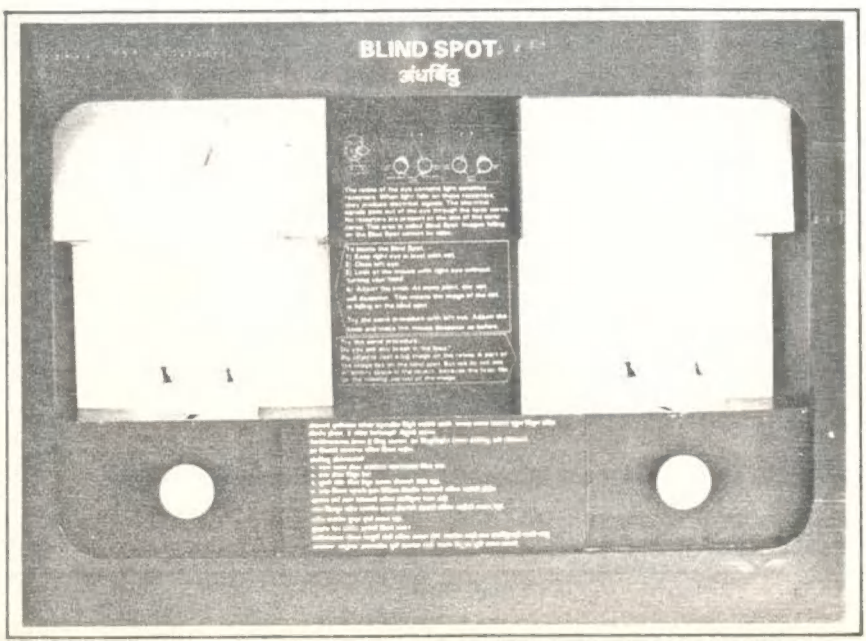
1. Keep right eye in level with cat.
2. Close left eye.
3. Look at the mouse with right eye without turning your head.
4. Adjust the knob. At some point, the cat will disappear. This means the image of the cat is falling on the blind spot.

Try the same procedure with left eye. Adjust the knob and make the mouse disappear as before.

Try the same procedure.

Do you see any break in the lines?

Big objects cast a big images on the retina. A part of the image lies on the blind spot. But we do not see an empty space in the object because the brain fills up the missing portion of the image.



MSE 'PERCEPTION'

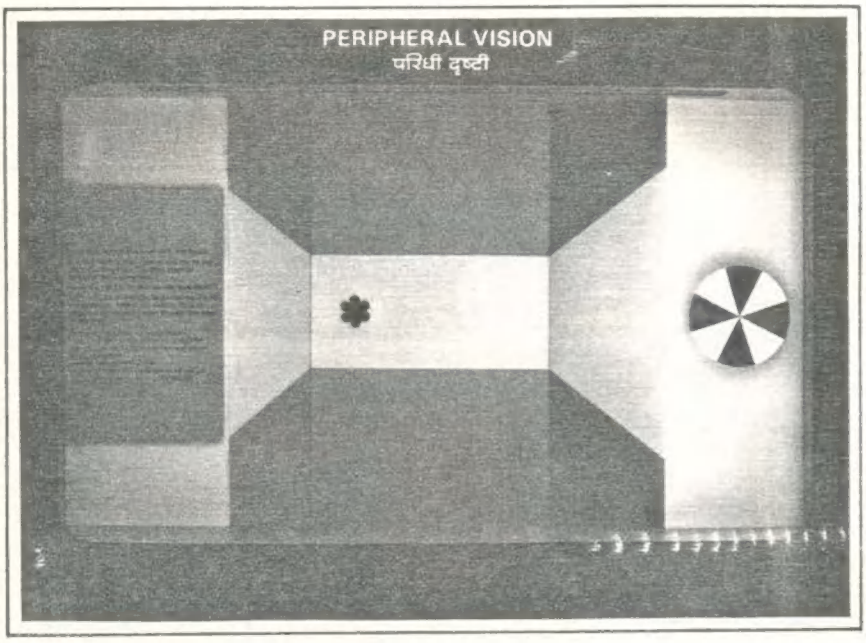
Exhibit No. 2

PERIPHERAL VISION

Keep your right eye in level with the flower. Without turning your head or eye, try to see the lines at the far right. The lines seem to disappear after some time.

Press the switch. Do you see the lines now?

Cells associated with the peripheral regions of the retina can detect only motion. That is why you can detect motion through the edge of the eye.



MSE 'PERCEPTION'

Exhibit No. 3

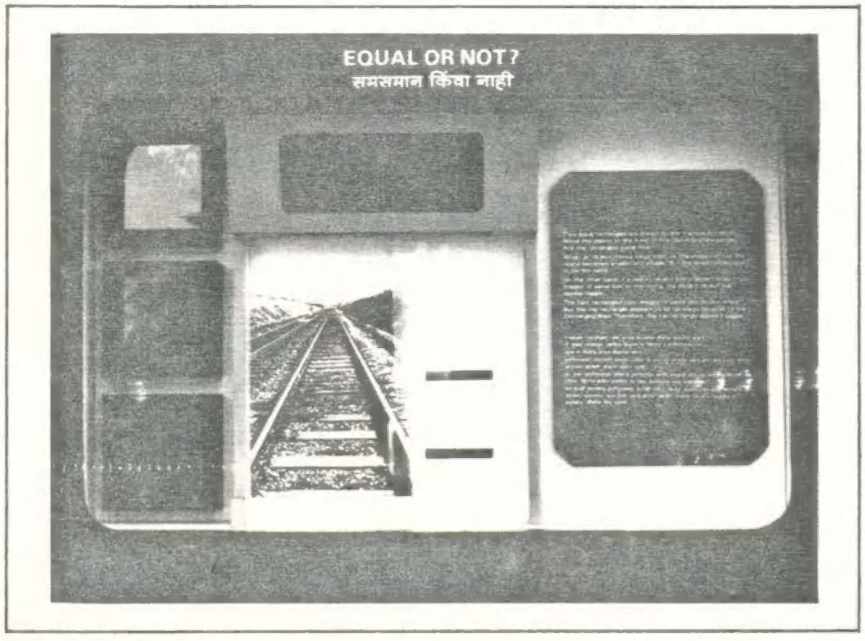
EQUAL OR NOT?

Two equal rectangles are drawn on the transparent plastic. Move the plastic to the front of the converging line pattern. Are the rectangles equal now?

When an object moves away from us, the image cast on the retina becomes smaller and smaller. But the object is perceived to be the same.

On the other hand, if a nearby object and a distant object cast images of the same size on the retina, the distant object will appear bigger.

The two rectangles cast images of the same size on the retina. But the top rectangle appears to be far away because of the converging lines. Therefore, the top rectangle appears bigger.



MSE 'PERCEPTION'

Exhibit No. 4

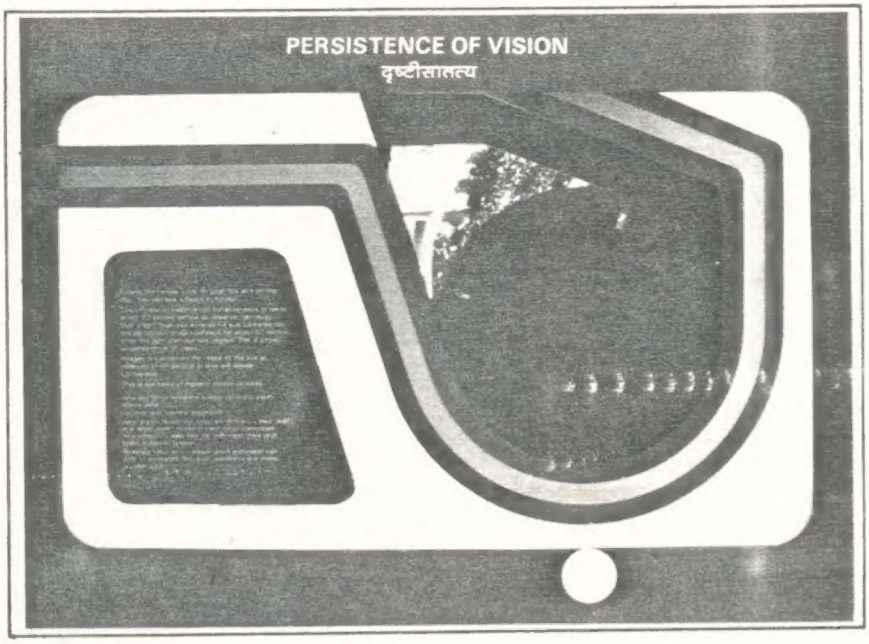
PERSISTENCE OF VISION

Rotate the handle. Look through the slits on the disc. You can see a figure in motion.

The process of vision is not instantaneous. it takes about 0.1 second before an observer perceives that a light flash has entered his eye. Likewise too, the perception of light persists for about 0.1 second after the light stimulus has ceased. This is known as persistence of vision.

Image projected on the retina of the eye at intervals of 0.1 second or less will appear continuous.

This is the basis of modern motion pictures.



MSE 'PERCEPTION'

Exhibit No. 5

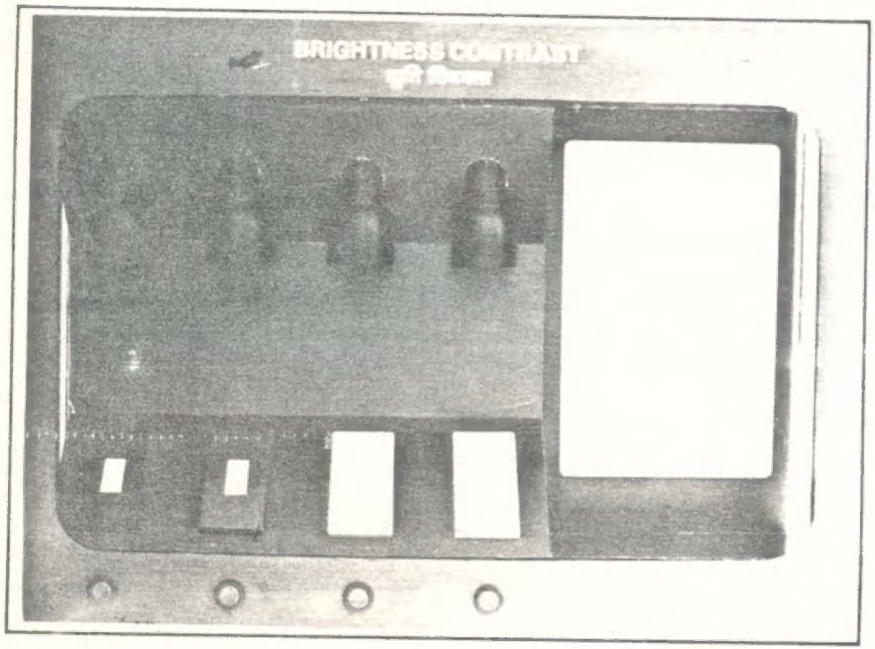
BRIGHTNESS CONTRAST

The four inscribed squares are the same shade of grey but appear different because of different backgrounds.

Illuminate the squares by pressing the switches. Do all the inscribed grey squares become brighter?

Whenever cells in one part of the retina are stimulated by light, the cells in neighbouring parts become less active. Therefore, grey areas surrounded by bright areas appear dark. Grey areas surrounded by dark areas appear bright.

When illuminated, bright areas become brighter. Therefore, grey areas with bright backgrounds appear darker. When illuminated, grey areas with dark backgrounds appear brighter.

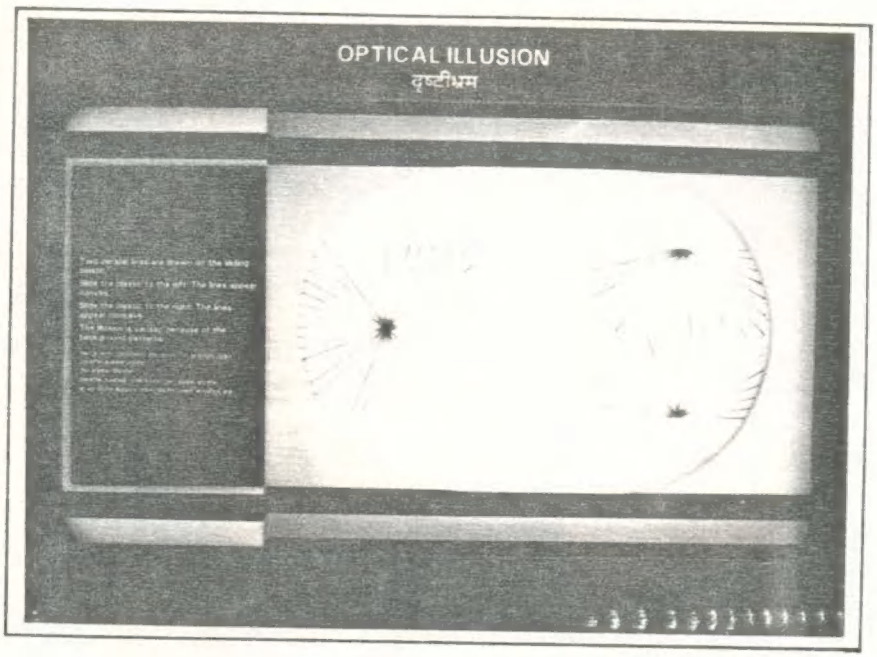


MSE 'PERCEPTION'

Exhibit No. 6

OPTICAL ILLUSION

Two parallel lines are drawn on the sliding plastic. Slide the plastic to the left. The lines appear convex. Slide the plastic to the right. The lines appear concave. The illusion is caused because of the background patterns.



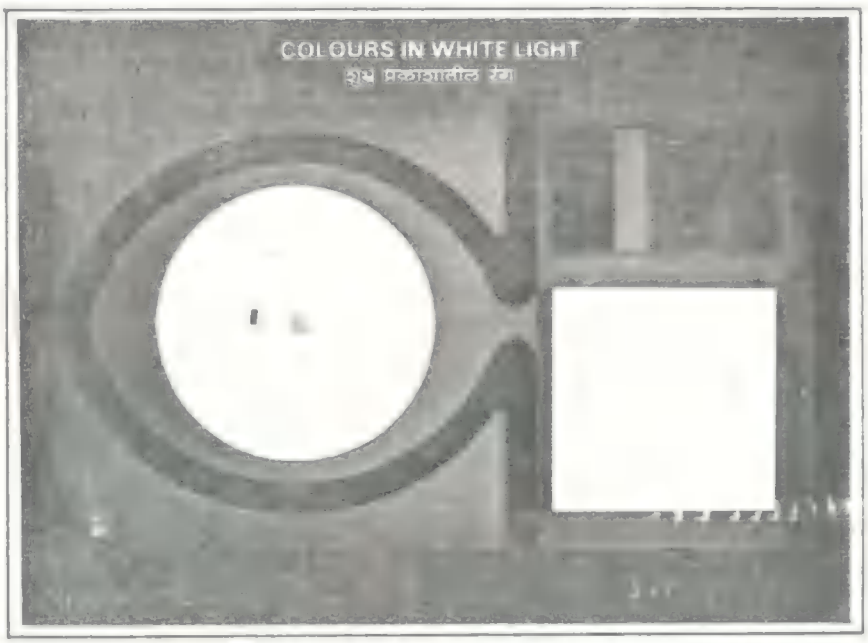
MSE 'PERCEPTION'

Exhibit No. 7

COLOURS IN WHITE LIGHT

Pass the switch. Observe that white light is broken into many colours by the prism.

What we see is the visible portion of light. Light exists even beyond the violet and red boundaries of the visible spectrum.



MSE 'PERCEPTION'

Exhibit No. 8

COLOUR VISION

Press the switches. Red, blue and green colours are seen on the screen. Observe that they combine to form other colours.

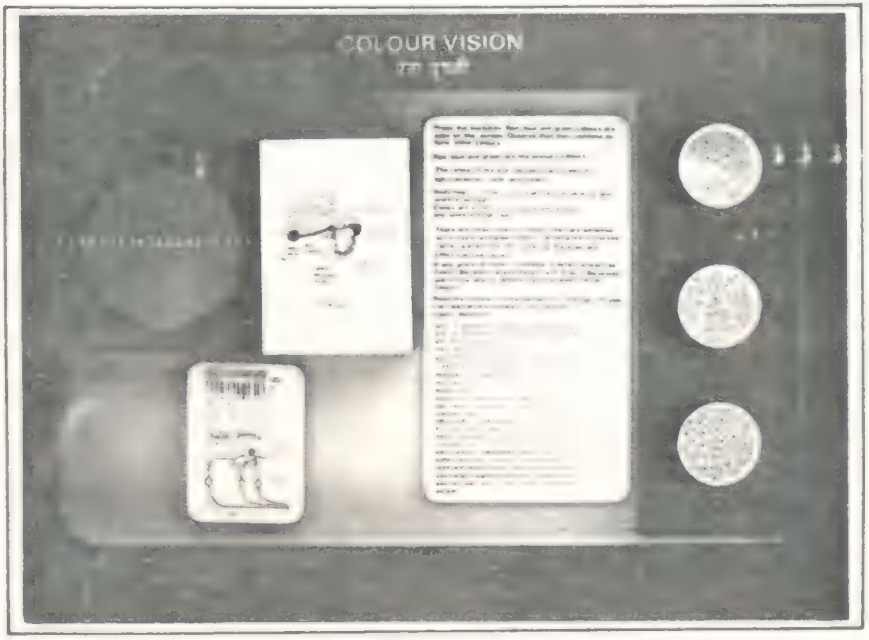
Red, blue and green are the primary colours.

The retina of the eye contains two types of light receptors, rods and cones.

Rods help us to perceive brightness of objects and work in dim light. Cones are essential for colour perception and work in bright light.

If one group of cones is missing, a defect known as Colour Blindness arises. People with Colour Blindness will not be able to differentiate between certain colours.

Read the numbers in the patterns on the right. If you can read all the numbers, you have no Colour Blindness.



MSE 'PERCEPTION'

Exhibit No. 9

COMPLEMENTARY COLOURS

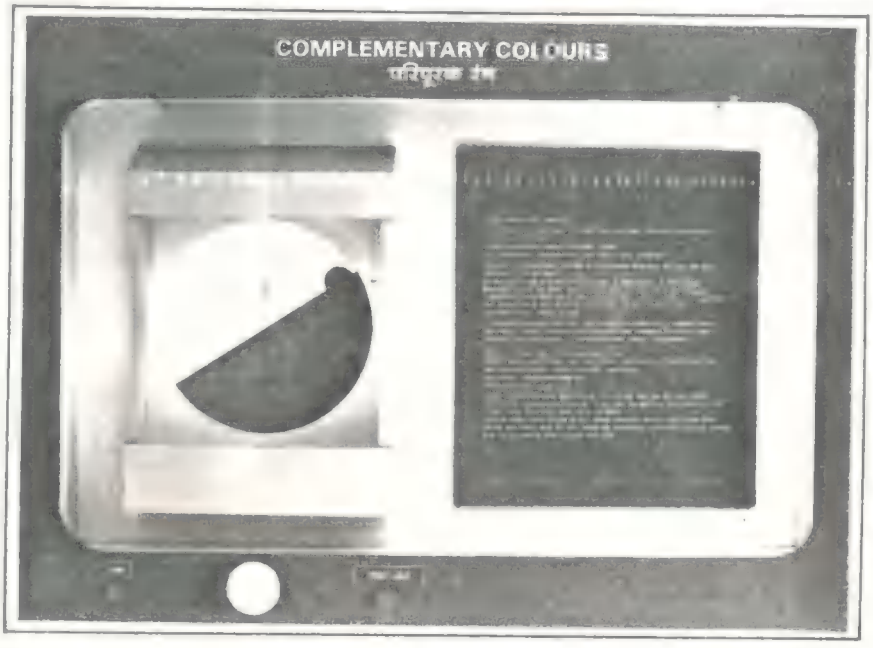
Press the START switch.

Turn the knob clockwise. You will see a red light flashing through the window on the disc. Push the switch marked FRONT LIGHT. Do you see any change in the red light?

Repeat the experiment for the anticlockwise direction. Do you see any change in the red light?

In the clockwise direction, the red light is followed by a white area. Because of the red light, the red receptors on the retina get fatigued. Therefore, when the white area appears next, what is seen is not white but white minus red, which is cyan (blue + green). Cyan is the complementary colour of red.

In the anticlockwise direction, the red light is followed by a black area. Now also, the red receptors on the retina get fatigued. Since red light is followed by a dark area, no complementary colour is perceived.



MSE 'PERCEPTION'

Exhibit No.10

BENHAM'S DISC

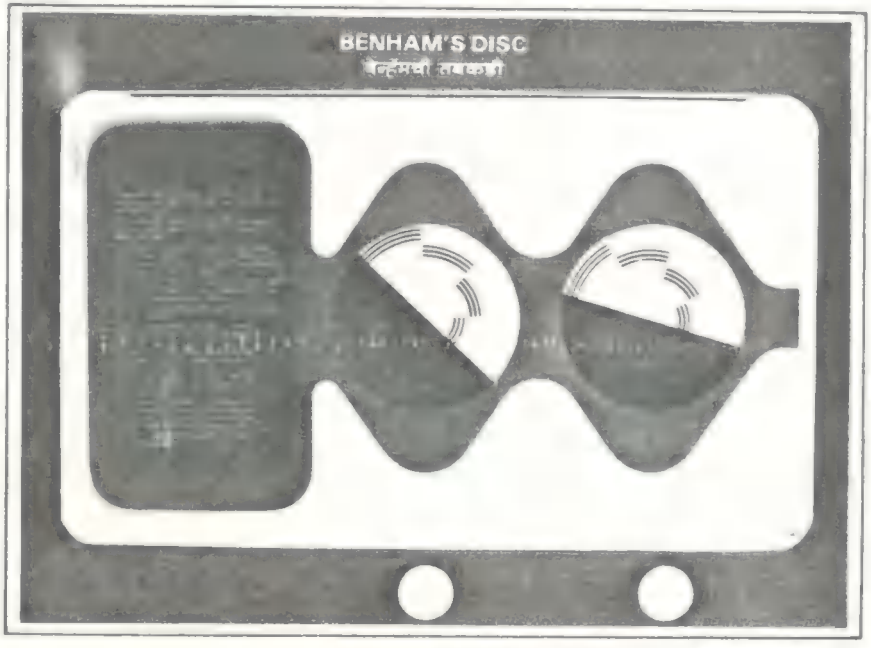
Rotate the disc clockwise. You find colours, from centre to the edge of the disc - red, yellow, green and blue.

Rotate the disc anticlockwise. You find colours, from centre to the edge of the disc - blue, green, yellow and red.

According to one theory of colour vision, when the eye sees colours, a sequence of ON and OFF neural signals are sent to the brain. This sequence is different for different colours.

When the disc rotates, the movement of the dark lines sets up ON and OFF neural signals. The brain interprets these signals as colours.

The patterns were first conceived by a scientist called Benham.



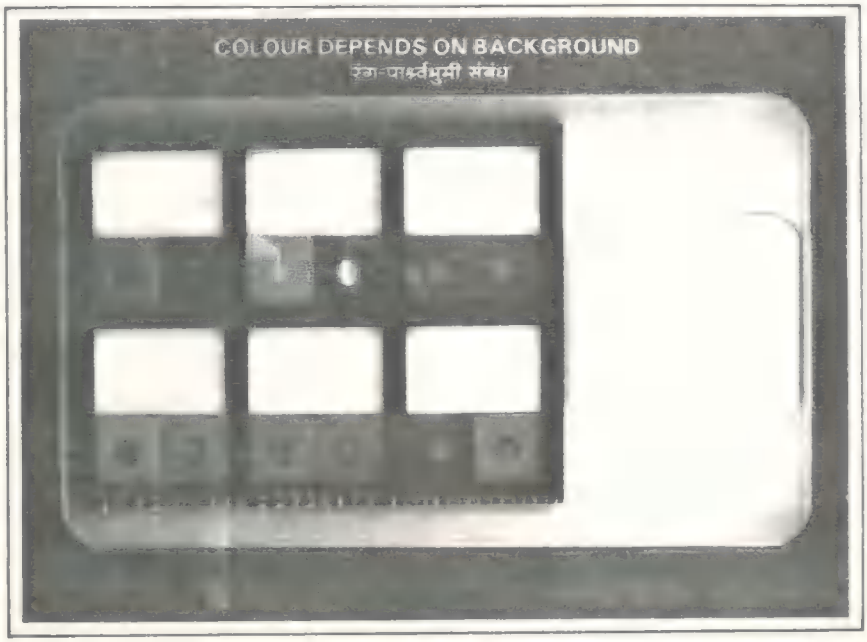
MSE 'PERCEPTION'

Exhibit No. 11

COLOUR DEPENDS ON BACKGROUND

Observe the six plastic sheets. Each sheet has two coloured patches with circular windows at the centre. Slide the sheet up. Are the colours seen at the two windows, the same?

When a coloured light excites cells in one part of the retina, the cells of the neighbouring part lose their activity and produce the complementary colour. The colour seen at the window is the original colour plus the complementary colour of the surrounding area.



MSE 'PERCEPTION'

Exhibit No. 12

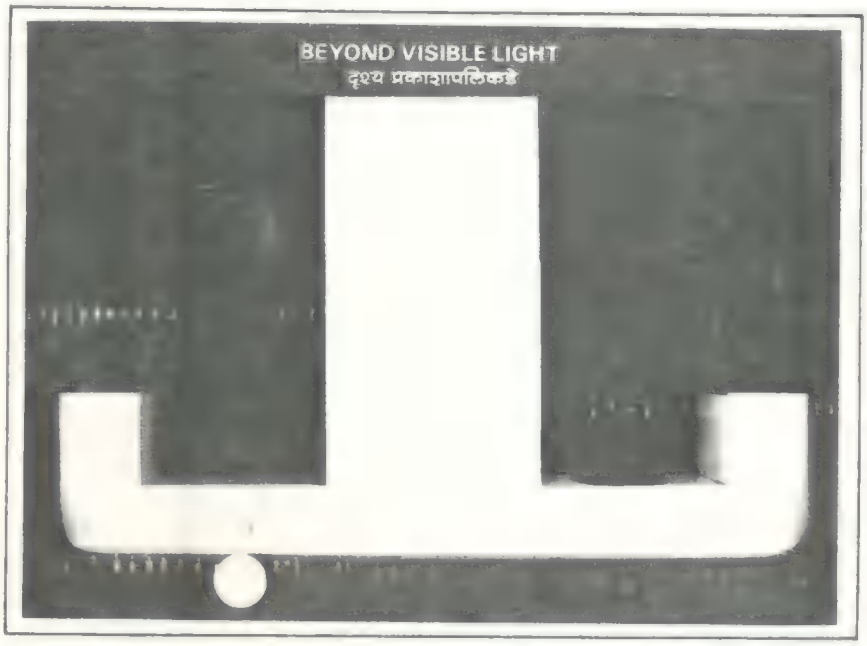
BEYOND VISIBLE LIGHT

Press the switch. Keep your hand at the bottom. You can feel heat radiation. Heat radiation is in fact infrared light.

The lamp gives out both red and infrared light. We can see only red light. Our skin can sense heat waves.

Turn the knob. The pictures glow under ultraviolet light.

The lamp gives out blue and ultraviolet light. We can see only blue light. The special paint of the picture glows under ultraviolet light.



MSE 'PERCEPTION'

Exhibit No. 13

DEPTH PERCEPTION

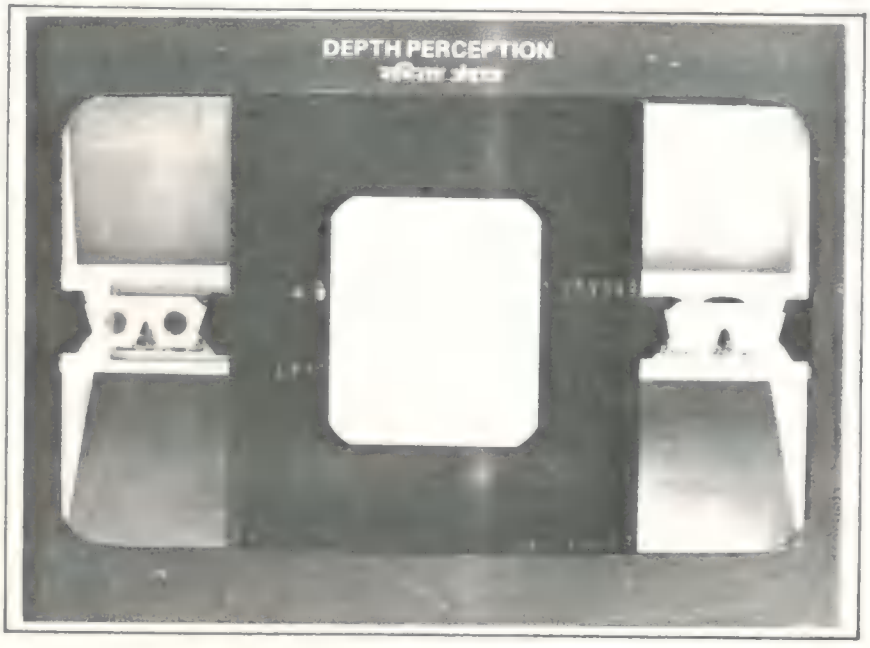
Look through the window at the pictures on the back wall. Observe that the left and right eyes see slightly different pictures.

Concentrate on the two pictures.

After a few seconds, the pictures will appear to move and then join. You can now see a three-dimensional picture!

The right eye and the left eye see objects at different angles. The brain combines the two images to give a sense of depth.

We need two eyes to perceive depth.



MSE 'PERCEPTION'

Exhibit No. 14

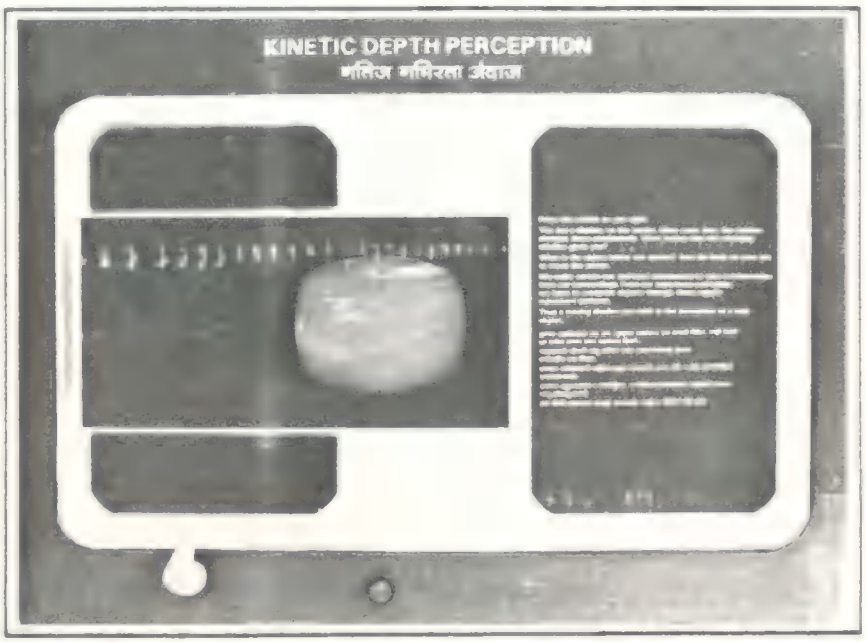
KINETIC DEPTH PERCEPTION

Press the switch on your right. You see a shadow on the screen. After some time, the shadow changes shape continuously. What feeling does this changing shadow give you?

What is the object behind the screen? Turn the knob on your left to move the screen.

We make certain eye and head movements to take in information from our surroundings. From our experience and habits, we learn to recognise objects through these regular movement patterns.

Thus, a moving shadow can lead to the perception of a solid object.



MSE 'PERCEPTION'

Exhibit No. 15

HEARING RANGE

A normal person can hear sounds over a frequency range of 20 Hertz to 20,000 Hertz. You can check your hearing range here.

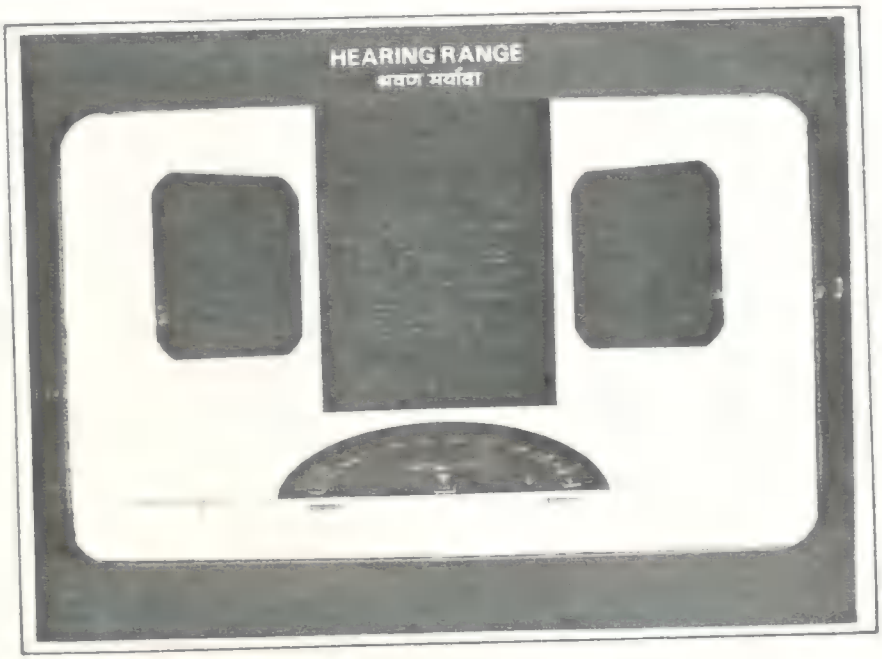
Press the START switch.

Press the switch marked 20 Hertz. Do you hear the sound?

Repeat for other frequencies.

What is the lowest frequency that you can hear?

What is the highest frequency that you can hear?



MSE 'PERCEPTION'

Exhibit No. 16

THRESHOLD OF HEARING

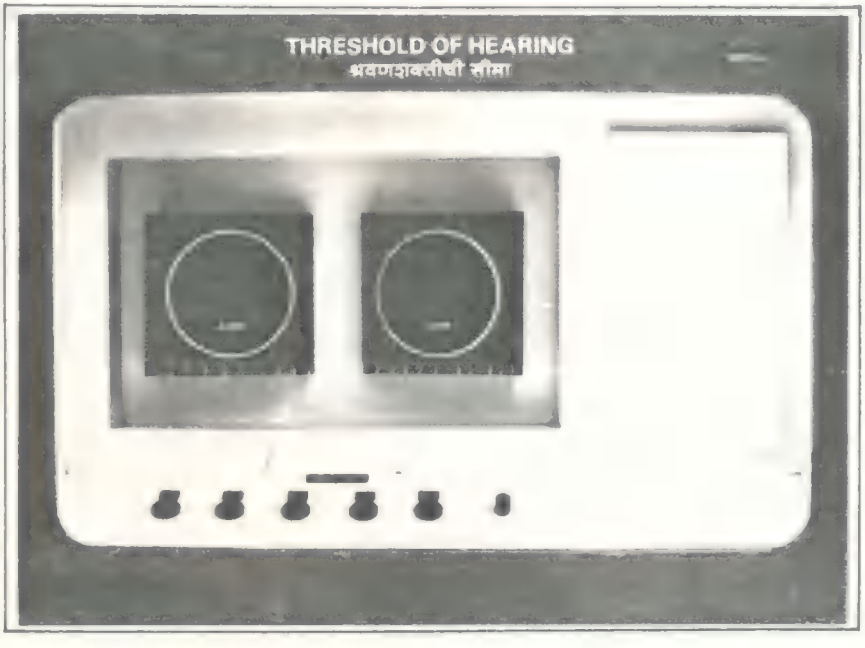
Here you can test your hearing sensitivity to different frequencies.

1) Press the START switch.

2) Press the switch marked 100 Hertz. While pressing the switch, adjust the volume control so that you can just hear the sound. This is the minimum audible level for that frequency.

3) Repeat for other frequnecies.

4) Is the volume control setting, at the minimum audible level, the same for all the frequencies?



MSE 'PERCEPTION'

Exhibit No. 17

STEREO HEARING

Observe that there are five speakers. There are five answer switches corresponding to the speakers.

Press the START switch.

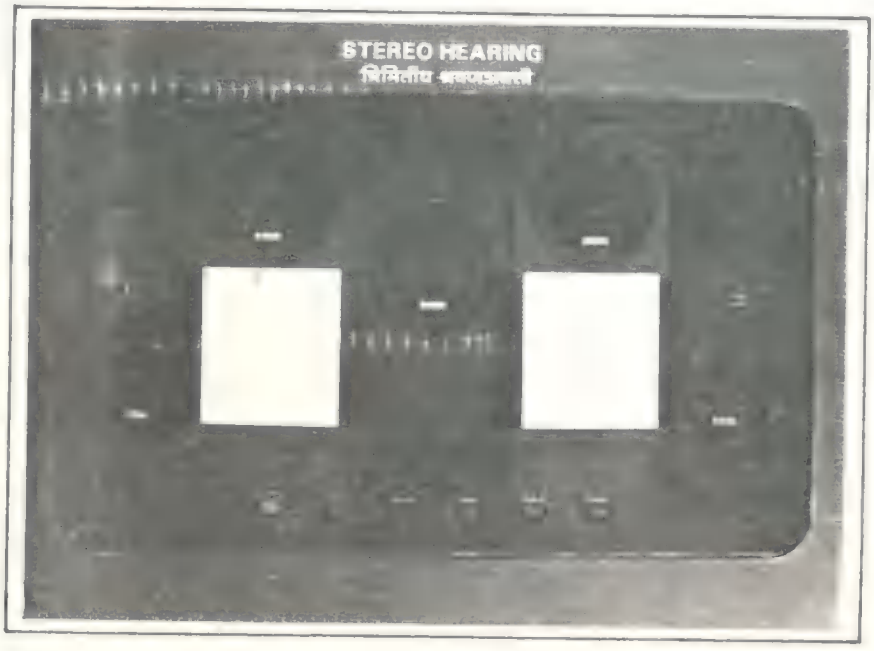
A sound is heard from one of the speakers. Which speaker made the sound? Press the corresponding answer switch.

If you are right, the RIGHT indicator glows.

If you are wrong, the WRONG Indicator glows.

Four more sounds will be heard. Answer as before.

With two ears we can locate a sound source. If the source of sound is located directly in front or back, sound waves reach the ears simultaneously. Sound waves from other directions will reach the ears at different times. This information is utilised in locating the source of sound.



MSE 'PERCEPTION'

Exhibit No. 18

ULTRASONIC SOUND

We can hear sounds of frequency upto 20,000 Hertz. Sounds of frequency above 20,000 Hertz are called ultrasonic sounds. Bats and Dolphins use ultrasonic sound to locate their prey and to navigate in darkness.

Bats and Dolphins emit ultrasonic pulses. These pulses travel to the object, get scattered and return. The time interval after which the echo is heard is a measure of the distance of the object.

MSE 'PERCEPTION'

Exhibit No. 19

HOT OR COLD?

Place left palm on the left disc and the right palm on the right disc. Wait for some time. Now place both palms on the middle disc for a short time. Do both palms feel the same degree of warmth?

The skin has the ability to adapt itself to the surrounding temperatures upto a certain limit. In this experiment, you first adapted your palms to different temperatures. Later, at an intermediate temperature, one palm feels hot and the other one cold.

MSE 'PERCEPTION'

Exhibit No. 20

ONE OR TWO?

Turn the knob and bring the pins together.

Keep your palm on the pins.

Do you feel the pressures of the two pins?

Turn the knob and separate the pins.

Keep your palm on the pins as before.

Do you feel the pressures of the two pins?

Keep trying till you feel two distinct skin pressures.

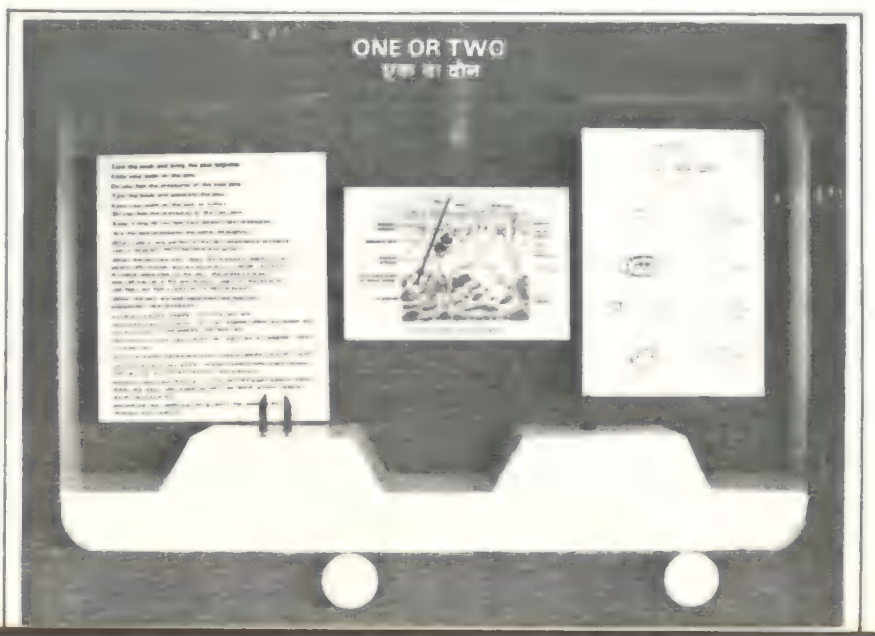
Are the skin pressures the same throughout?

When cells in one portion of the skin experience pressure, cells in adjacent parts become less active.

When the pins are very close, the pressure regions of adjacent cells overlap and we experience a single sensation.

At some separation of the pins, the pressure area of one cell may lie in the low activity region of the adjacent cell. Here we feel a reduction in skin pressure.

When the pins are well separated, we feel two independent skin pressures.



MSE ' PERCEPTION'

Exhibit No. 21

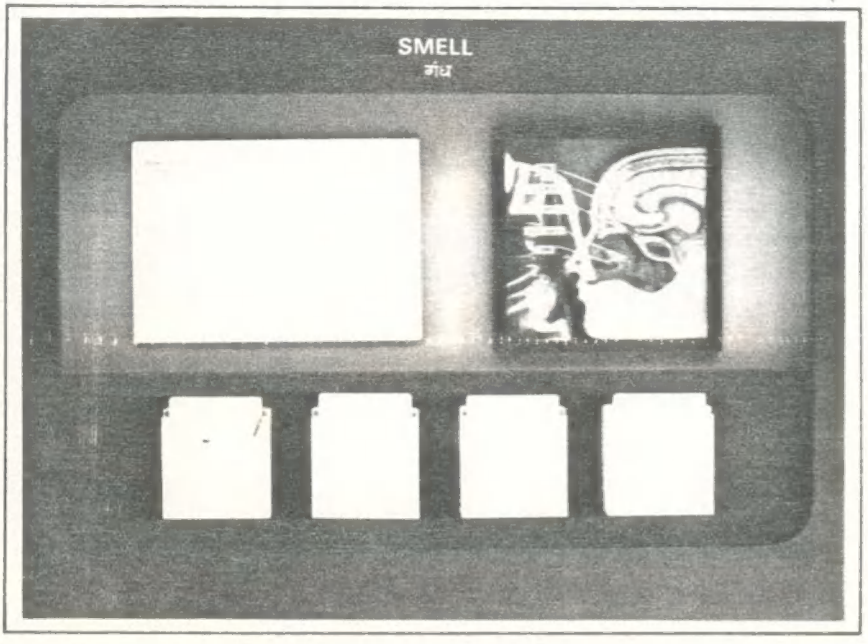
SMELL

Molecules from volatile substances travel to a cell layer called Olfactory Epithelium in the nose. Here the molecules react with the cells to produce neural signals leading to the perception of smell.

The smelling range is different for men, animals and insects.

According to one theory, all smells could be created by suitably mixing seven basic smells. These primary smells are - camphoraceous, musky, floral, pepperminty, ethereal, pungent and putrid.

What is common to all smelling substances is that they are all volatile and soluble in water, even though only to a smell extent.



MSE 'PERCEPTION'

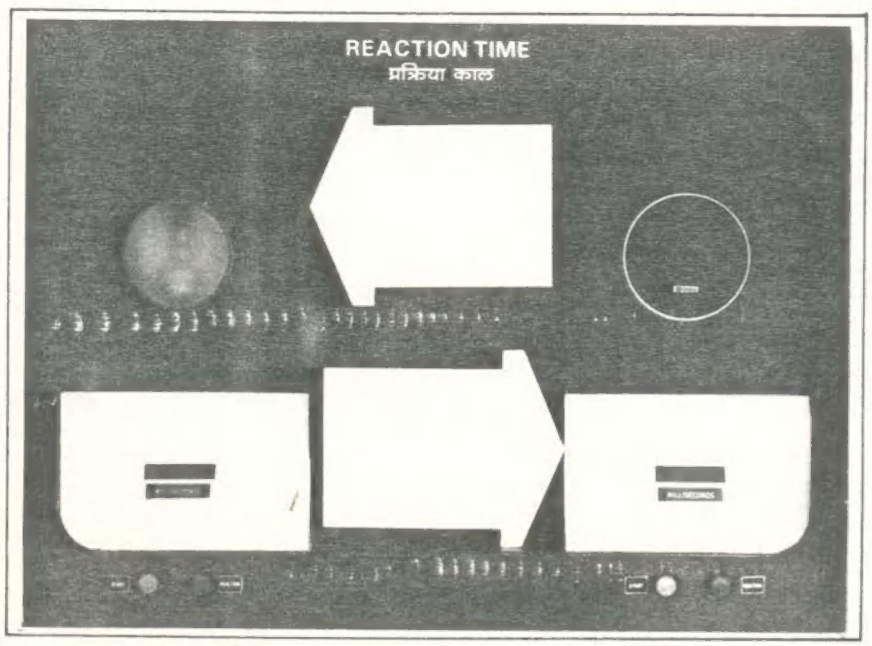
Exhibit No. 22

REACTION TIME

Nerve signals take a finite time to travel from the sensory organs to the brain and then from the brain to the body parts. This time is called the reaction time.

a) Press the START switch. The counter reads 000 milliseconds. Keep your finger ready at the REACTION switch. A light flashes suddenly. Press the REACTION switch as soon as you see the light. The counter records your reaction time.

b) Press the START switch. The counter reads 000 milliseconds. Keep your finger ready at the REACTION switch. A sound is heard from the speaker suddenly. Press the REACTION switch as soon as you hear the sound. The counter reads your reaction time.



MSE 'PERCEPTION'

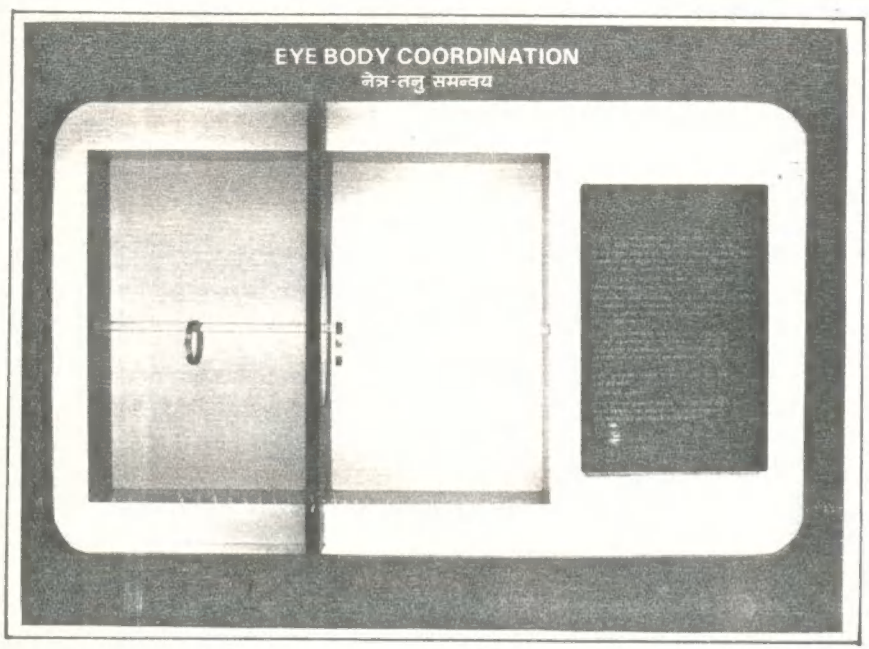
Exhibit No. 23

EYE BODY CO-ORDINATION

There are two rings on either side of a two-sided mirror. Hold the left ring with the left hand and the right ring with the right hand. Look at the image of the right ring in the mirror. Move the left ring. How does it feel?

Look at the image of the left ring in the mirror. Move the right ring. How does it feel?

We make body movements under visual guidance. Therefore, we feel uncomfortable when moving one ring while looking at the image of the other ring in the mirror.



MSE 'PERCEPTION'

Exhibit No. 24

TIME ESTIMATION

a) Press the RESET switch.

Press and hold the TIME switch.

When in your estimate, 1 second has elapsed, release the switch. The counter shows the actual elapsed time.

b) Press the RESET switch.

Press and hold the TIME switch.

When in your estimate, 5 seconds have elapsed, release the switch. The counter shows the actual elapsed time.

According to one theory, we have an internal body clock which helps us to monitor the passage of time. According to another theory, events which fill the passage of time help us to perceive time.